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INVENTORY OF CURRENT BARK-BEETLE HAZARD IN YELLOW PINE STANDS OF THE EASTERN LASSEN AREA, LASSEN NATIONAL FOREST - CALIFORNIA

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INVENTORY OF CURRENT BARK-BEETLE HAZARD IN YELLOW PINE STANDS OF THE EASTERN LASSEN AREA, LASSEN NATIONAL FOREST - CALIFORNIA

By

M. M. Furniss

SUMMARY

In 1951, personnel of the Berkeley Forest Insect Laboratory conducted a hazard survey of old-growth pine stands in the eastern portion of the Lassen National Forest. This survey was carried out for the purpose of classifying these stands by their relative susceptibility to bark-beetle attack. This information will be used in directing sanitation-salvage logging operations into the stands which otherwise are expected to suffer severe loss from bark beetles.

The field sampling resulted in classifying 95,000 acres of old-growth yellow pine into four hazard units. The work was performed by one-man crews who conducted a 1.1 per cent cruise by means of 1/2-acre circular plots. The field measurements included the number of high-risk trees, volume of standing pine loss, volume of pine stand and environmental growth reduction. These data were analysed by means of an alinement chart method of correlating them to expected future loss. The area included in the survey was then divided into four units, each differing in relative hazard. Of these units, the Coble Mountain Unit (map) is of highest hazard and should be the first to be "bug-proofed" by sanitation-salvage logging treatment. Should administrative considerations require that any of the units be subdivided, considerable basic data are attached for that purpose.

INTRODUCTION

This report concerns the results of an insect hazard[1/] survey conducted by field crews of the Berkeley Forest Insect Laboratory in the summer of 1951. The survey included the major remaining virgin yellow pine stands in the eastern part of the Lassen National Forest. Cut-over stands were deemed to be of very low hazard and were excluded. Also excluded were lodgepole pine and fir types, non-timbered areas and timbered areas which previously had been selected for sanitation-salvage[2/] treatment because of their very high loss rate. The remaining approximately 95,000 timbered acres are classified

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1/ The term "hazard" as used in this report refers to the susceptibility of pine stands to loss resulting from bark-beetle attack.

2/ "Sanitation-salvage" is the selective removal, by logging, of currently infested trees and high risk trees, or trees which are currently in poor health and subject to bark-beetle attack.

by relative hazard in this report. Practically all of this area is National Forest land.

The present management of this area contains provisions for the systematic deployment of sanitation-salvage cuttings until the entire area has been treated or "bug-proofed" as it is so often called. Perhaps eight years will be required to accomplish this objective. In the meantime, a high current loss rate indicates that serious stand depletion and timber waste is likely to occur on certain areas. In order to minimize this loss, it is essential that the location of stands of highest hazard be known so that cuttings can be distributed according to needs. The Berkeley Forest Insect Laboratory was requested to provide up-to-date hazard information for this purpose. A previous hazard inventory (3), including the area described in this report, was made in 1937. However, with the shrinkage of old-growth area to a fraction of its former size, that classification has become too general to enable the selection of small units for cutting at this time. Also, recent loss surveys had resulted in contradictions between current loss and the original hazard classification. Although much of this apparent discrepancy could probably be attributed to lack of proven statistical significance in the loss survey data, there was the possibility that the hazard had actually changed. One viewpoint was that in some stands persistent beetle activity had lowered the hazard of future loss by killing most of the susceptible trees while in other places, large numbers of high-risk trees had accumulated because climatic and biotic factors had kept the beetles suppressed. Abnormal annual variation in loss from locality to locality occasioned by such influences as heavy windthrow and fire also accounts for some of the discrepancy between the original hazard ratings and recent observations and loss measurement. Aside from these reasons for a fresh appraisal of hazard, the principal value of the recent survey was believed to lie in the application of the data to smaller units.

METHODS OF DETERMINING BARK-BEETLE HAZARD

Pine mortality resulting from bark-beetle attacks in the extensive yellow pine stands east of the Sierra Nevada-Cascade Mountain range has been observed to differ by locality over extended periods. This variation in loss level between forested areas has been the subject of intensive study in rather recent times. The outcome of this study has been that basic factors bearing upon bark beetle-caused loss have been identified and it has been found that they can be manipulated in such a way that pine mortality is decreased and the forest resource is given protection from insect depredation.

The original work involving bark-beetle hazard in California was reported by Miller, Salman and Johnson (5). The first field inventory was conducted in 1937 by Johnson (3) on the east Lassen National Forest including the areas covered by this report. Johnson used as his criteria of hazard the two factors of recent loss and the volume of high risk (1) trees in the stand. Loss and risk, which had been defined only one year previous to the inventory, were weighted equally in arriving at each hazard classification. This original inventory proved very useful in the following years as a guide in directing cutting operations and as a base for annual loss surveys.

In the interval between the 1937 and 1951 surveys, much research data were compiled on the subject of factors related to insect loss. An analysis of several factors correlated with loss on sample plots has been prepared recent. by Keen and Merriam (4). The alinement chart method of determining hazard as prepared by these authors was applied to the 1951 survey data. The factors used were: (1) number of risk 4 trees, (2) volume of standing insect-killed trees, (3) total stand volume and, (4) growth reduction. Keen and Merriam found that these four factors would account for approximately 80 per cent of the loss on sample plots during the five-year period for which there were complete data. Numerous other factors were measured during the 1951 survey in accordance with the work plan (6), but all were not used in determining relative hazard because only the above 4 factors have since been shown to be highly correlated with loss.

Because different field methods and different factors were used, the hazard classifications determined from the 1937 and 1951 surveys are not directly comparable. However, there is nothing to indicate that the relative hazard of the stands covered by the two surveys has changed a great deal. Perhaps the main difference is that the reporting units have been changed somewhat to fit current conditions and needs. It is anticipated that some hazard units (a unit is a "homogeneous" reporting area) may still be too large and will have to be subdivided to encompass that volume of high-risk pine that can be handled in a single sale. It is for this purpose that Tables 3, 4, 5, and 6 are provided. These tables contain data on stand volume, risk distribution and loss by individual sections for each reporting unit. These data were obtained from a 1.1 per cent sample cruise using 1/2-acre circular plots which, according to Hall (2), should result in classifying hazard on areas exceeding 5,000 acres within a satisfactory sampling error. The actual values for stand volume, volume of risk trees and loss for any single section may differ greatly from the values given in the table; however, they will agree closely with actual values when grouped to make up solid units of area of 5,000 acres and more. One should guard against the tendency to break data into statistically meaningless small units, when sampling results are presented by the section from which they were obtained.

Survey Procedure

The survey was conducted during July and August 1951 by field crews quartered at Blacks Mountain Experimental Forest Headquarters. Sampling by means of 1/2-acre circular plots was employed because this procedure enabled the use of one-man crews. Each fieldman acted as his own compassman while traveling between plots and as estimator and recorder while on the plots. This disposition of the available manpower proved economical. Two men did the sampling between July and mid-August, but were joined by 3 more men at that time.

The cruise lines were located 40 chains apart with 1/2-acre circular plots established at uniform intervals of 10 chains on line. Equipment carried included cruiser's stick, tatum containing field forms, aluminum paint in a pressurized can, and compass and staff. The compass staff was stuck in the ground at each plot center. Alternate stripes of red and silver paint on the staff increased the ease with which it could be seen from points near a plot

boundary. Doubtful trees were determined to be in or out of each plot by pacing to or from the plot center. A spot of aluminum paint was applied to each tree facing the plot center in the heavier stands to avoid omitting a tree or including trees twice. Local volume tables were used in order to eliminate the necessity of recording tree heights.

DISCUSSION AND RECOMMENDATIONS

The accompanying map shows four units into which the area was divided on the basis of anticipated relative future loss as determined from hazard factors obtained by field sampling. The area of the units defined on the map was purposely kept large to doubly insure the probability of assigning the correct relative hazard to them. The units are numbered according to decreasing bark-beetle hazard. Thus, the Coble Mountain Unit at low elevation in the north end of the reporting area is classed as highest hazard, while the Bogard Unit at the higher elevation in the south end of the reporting area is of lowest hazard. The area of second highest hazard is the Hat Creek Rim Unit which experienced considerable blowdown in the spring of 1951. The blowdown resulted in large build-up of beetle numbers and consequent increased tree killing. This tendency toward heavier killing continued through 1952 so that the immediate hazard of this unit is actually higher than the longer term classification indicated on the map. In other words, the current rather high rate of loss can be expected to fall off over a period of a few years, although it will undoubtedly continue to average higher than the Halls Flat and Bogard Units because it is of higher hazard. The immediate threat to stands in the Hat Creek Rim Unit stemming from the 1951 blowdown has been combatted to a degree by logging of beetle-infested trees. If this campaign can be strengthened and put on a sound control basis, the loss can be checked while sanitation-salvage operations can be directed over the Coble Mountain Unit. Active infestations in the Halls Flat and Bogard Units also should be brought under the logging-control program similar to that instituted in the Hat Creek Rim Unit. Such a two-fold approach, utilizing sanitation-salvage logging in the unit of highest hazard and direct, but short term, control by removal of only infested trees in the other units, should result in minimum loss and waste pending the time when the remaining old growth can be given a harvest cutting. However, a program involving direct control by logging infested trees should not be undertaken on such a scale that it interferes with the fastest possible treatment of the Coble Mountain Unit by the sanitation-salvage logging.

Attention is directed in Table 1 and 2 to the fact that the problem of alleviating loss involves more than merely locating the stands containing the greatest volume of high-risk trees. Otherwise, one might conclude that the Hat Creek Rim Unit should receive treatment first because it has the greatest amount of high-risk volume. Actually, risk is only one of the four factors correlated with loss and it is evident that the sum effect of all such factors considered in this survey is greatest on the Coble Mountain Unit.

LITERATURE CITED

(1) Bongberg, J. W. 1942. Descriptions and illustrations of risk ratings for ponderosa and Jeffrey pine in eastside forests of Calif. (Mimeographed, Berkeley Forest Insect Laboratory, revised 1951). 3 pp.

(2) Hall, R. C. 1951. A proposed design for a re-appraisal of hazard on the east Lassen National Forest. (Typed, Berkeley Forest Insect Laboratory). 4 pp.

(3) Johnson, P. C. 1938. Forest insect hazard inventory project report; eastern Lassen area, California. (Typed, Berkeley Forest Insect Laboratory). 13 pp.

(4) Keen, F. P. and R. A. Merriam. 1953. Analysis of area hazard factors associated with western pine beetle damage in ponderosa pine stands of eastern Oregon and Washington. (To be mimeographed, Berkeley Forest Insect Laboratory).

(5) Miller, J. M., Salman, K. A., and Johnson, P. C. 1941. Bark-beetle hazards in the pine stands of northeastern California. (Printed report, Berkeley Forest Insect Laboratory, part I, 15 pp., part II, 277 pp.

(6) Furniss, M. M. 1951. Work Plan. Inventory of bark-beetle hazard, eastern Lassen area, Lassen National Forest, California. (Typed, Berkeley Forest Insect Laboratory). 14 pp.

Table 1. Average Green Pine Stand Volume, Risk Distribution and Pine Loss by Units

Unit	Green Stand (Pine) bd. ft./ac.	Volume in bd.ft./Acre Risk Class				% Risk	Pine Loss (Standing)
		Low	3	4	3 and 4	3&4	bd.ft./ac.
Coble Mtn.	8173	7177	763	233	996 ± 102	12.2	1391
Hat Creek Rim	12241	10437	994	810	1804 ± 159	14.7	1327
Halls Flat	10299	8888	842	569	1411 ± 158	13.7	1080
Bogard	16586	14984	1048	553	1601 ± 195	9.7	1154

Plus and minus (±) values are for an acceptible sampling error of 25% at the 95% confidence level.

Table 2. Total Volume of Green Pine Stand, High Risk Pine, and Pine Loss by Units.

Unit	Acreage of Virgin Pine (Estimated)	Green Pine Stand (MBM)	Risk 3 & 4 (MBM)	Pine Loss (Standing) (MBM)
Coble Mtn.	20,000	164,000	19,900 ± 2040	27,800
Hat Creek Rim	27,000	331,000	48,700 ± 4300	35,800
Halls Flat	25,000	258,000	35,300 ± 3950	27,000
Bogard	23,000 1/	381,000	36,800 ± 4500	26,600
Total	95,000			

1/ In addition, there are approximately 16,000 acres of lodgepole pine and fir in this unit.

Table 3. Coble Mountain Unit

Section	Volume in Bd. Ft./Acre				
	Risk Class			Loss (Pine)	Green Stand (Pine)
	Low	3	4		
T35N R6E					
13	2087	94	0	775	2181
14	2748	276	0	552	3024
15	4154	530	180	942	4864
16	2820	235	28	756	3083
17	4002	106	55	1874	4163
20	6105	104	668	488	6877
21	7017	656	311	1054	7984
22	7826	659	74	2152	8559
23	7809	1127	4	848	8940
24	3772	215	265	332	4252
25	3758	720	0	174	4478
26	8545	199	0	1210	8744
27	11878	689	296	1942	12863
28	5542	322	573	2163	6437
29	4866	556	55	1988	5477
30	7417	600	0	1146	8017
31	5948	1001	171	1168	7120
32	7131	1061	122	936	8314
33	11692	752	880	785	13324
34	6299	381	990	3385	7670
35	7899	1251	122	1568	9272
36	10758	1592	592	1080	12942
T34N R5E					
1	8950	1489	225	1776	10664
2	5925	1276	114	1075	7315
3	3330	0	0	3700	3330
11	12458	1229	28	2515	13715
12	13055	2206	515	1785	15776
T34N R6E					
1	13044	638	592	191	14274
2	8786	1948	122	2549	10856
3	9679	986	0	828	10665
Average	7177	763	233	1391	8173

Table 4. Hat Creek Rim Unit

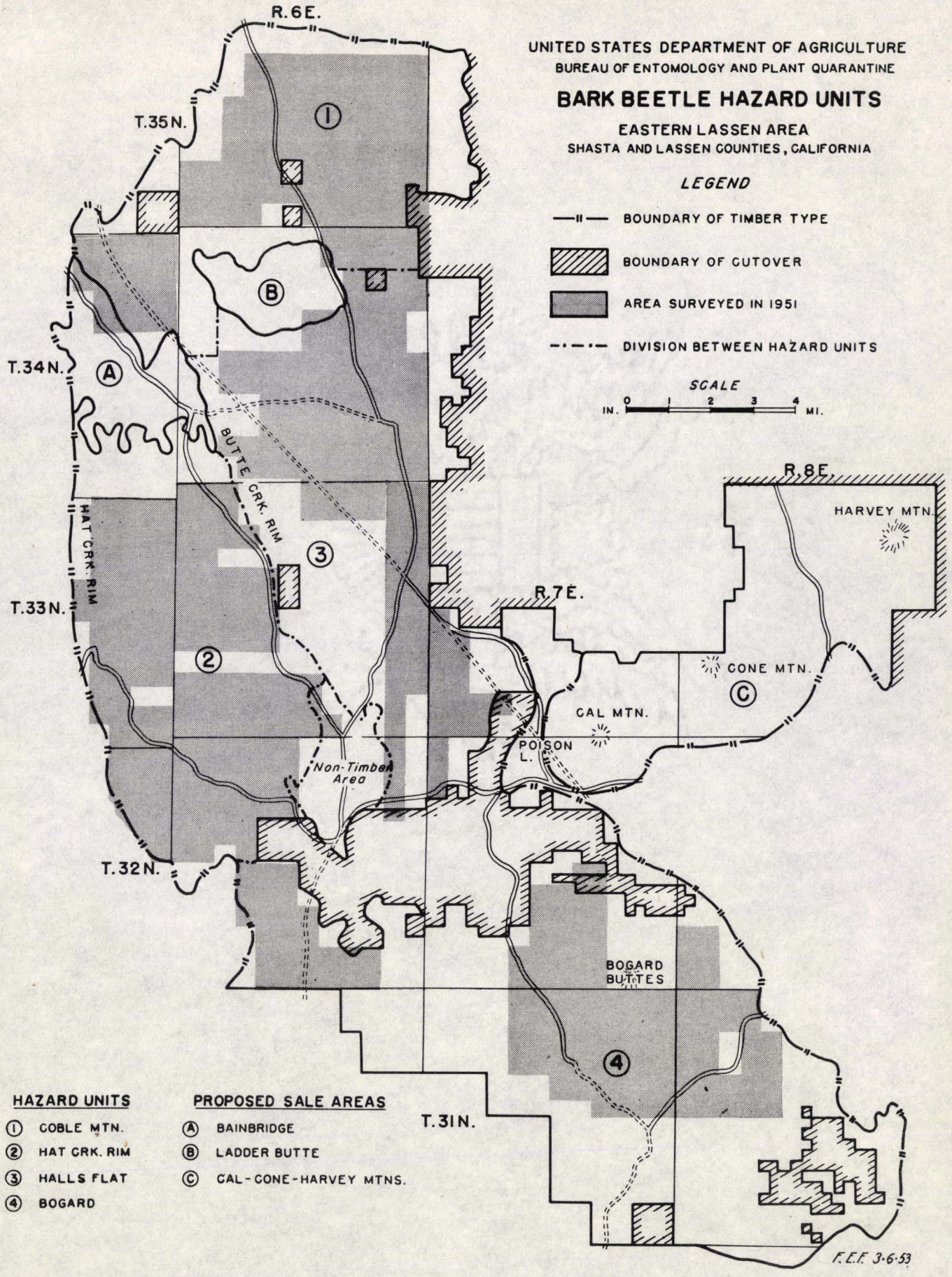
Section	Volume in Bd. Ft./Acre				
	Risk Class			Loss (Pine)	Green Stand (Pine)
	Low	3	4		
T33N R5E					
1	8936	711	0	817	9647
2	8545	1405	531	1880	10481
11	11240	98	490	2085	11828
12	12416	718	0	0	13134
13	9850	880	1815	500	12545
14	13159	701	302	946	14162
15	6483	0	0	0	6483
23	9245	881	40	1832	10166
24	7999	1461	1050	1629	10510
25	4565	360	2510	1597	7435
26	10911	74	0	1509	10985
35	10737	287	0	190	11024
36	8472	704	185	682	9361
T33N R6E					
5	11378	1552	872	1302	13802
6	8364	1748	2572	1719	12684
7	7781	40	2859	472	10680
8	7207	592	1465	0	9264
16	4550	3140	44	0	7734
17	9190	305	76	757	9571
18	7541	664	436	335	8641
19	10575	635	242	2678	11452
20	7489	0	0	124	7489
21	6314	1070	0	0	7384
27	7060	4000	3490	2060	14550
28	11170	1518	670	0	13358
29	11995	0	0	2172	11995
30	10752	0	0	1325	10752
31	10215	215	1194	721	11624
32	13819	511	1165	122	15495
33	13935	2591	144	2012	16670
34	14290	0	582	2070	14872
T32N R5E					
1	10767	0	585	849	11352
2	16215	430	540	1962	17185
11	13010	0	0	10412	13010
12	17302	2415	1432	2388	21149
13	20732	2840	375	2283	23947
T32N R6E					
4	11391	2446	94	690	13931
5	4868	215	652	775	5735
6	14198	180	572	180	14950
7	9585	781	2888	1371	13254
8	15778	1961	2312	2840	20051
9	5256	2121	2258	1091	9635
17	14820	1458	240	1401	16518
18	9127	2036	965	610	12128
Average	10437	994	810	1327	12241

Table 5. Halls Flat Unit

Section	Volume in Bd. Ft./Acre				
	Risk Class			Loss (Pine)	Green Stand (Pine)
	Low	3	4		
T34N R6E					
11	8365	289	1205	788	9859
12	4610	1241	0	0	5851
13	5320	0	1486	3693	6806
14	5554	1122	1131	0	7807
15	5935	1065	386	1279	7386
20	7329	808	0	670	8137
21	5531	296	0	1992	5827
22	6530	772	0	1282	7302
23	14100	1719	296	429	16115
24	7786	2124	529	1765	10439
25	9715	582	1058	635	11355
26	5464	436	258	550	6158
27	5962	822	500	390	7284
28	10365	479	358	3196	11202
32	7122	480	0	240	7602
33	9519	1634	738	1176	11891
34	10990	1886	335	1238	13211
35	8829	1024	0	0	9853
36	7904	0	0	616	7904
T33N R6E					
1	10896	1001	335	615	12232
2	7616	436	0	436	8052
3	8791	1440	615	1449	10846
12	10315	386	834	0	11535
13	10478	1611	180	500	12269
24	3522	438	0	0	3960
25	4546	1279	0	1126	5825
36	15730	1455	2390	781	19575
T33N R7E					
19	3578	343	0	0	3921
30	3511	644	0	1134	4155
31	10422	988	739	2078	12149
32	14947	0	0	2903	14947
T32N R6E					
1	12482	772	1115	1258	14369
12	15975	0	3680	1855	19655
T32N R7E					
6	13782	1905	360	2750	16047
7	17552	0	1373	960	18927
Average	8888	842	569	1080	10299

Table 6. Bogard Unit

Section	Volume in Bd. Ft./Acre				
	Risk Class			Loss (Pine)	Green Stand (Pine)
	Low	3	4		
T32N R6E					
20	18046	1545	0	0	19591
21	21392	1846	0	999	23238
27	46585	0	3065	7410	49650
28	25285	0	0	4082	25285
33	20672	2037	0	35	22709
34	14790	161	605	1858	15556
35	15722	688	538	751	16948
T32N R7E					
21	18500	665	0	2100	19165
22	12425	0	0	1915	12425
23	11295	965	0	865	12260
27	18740	785	1775	2410	21300
28	19005	3402	0	0	22407
33	8878	436	615	0	9929
34	10969	1511	431	1121	12911
T32N R8E					
30	4965	3065	0	0	8030
31	6459	284	60	1379	6803
T31N R7E					
1	15288	1700	901	166	17889
2	12208	1252	0	540	13460
3	22206	4176	1672	1519	28054
4	2759	0	0	0	2759
9	11571	1977	644	654	14192
10	16471	924	1186	899	18581
11	10624	495	0	422	11119
12	13520	50	0	166	13570
13	9512	241	1399	378	11152
14	7752	1560	0	0	9312
15	11155	690	1218	604	13063
T31N R8E					
5	14551	364	1356	1169	16271
6	13920	900	0	1821	14820
7	23184	2054	394	331	25632
8	19168	0	166	1451	19334
9	8148	1365	2672	925	12185
16	8130	0	670	2320	8800
17	13345	0	0	1054	13345
18	17220	1532	0	1046	18752
Average	14984	1048	553	1154	16586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BARK BEETLE HAZARD UNITS
EASTERN LASSEN AREA
SHASTA AND LASSEN COUNTIES, CALIFORNIA
LEGEND
BOUNDARY OF TIMBER TYPE
BOUNDARY OF CUTOVER
AREA SURVEYED IN 1951
DIVISION BETWEEN HAZARD UNITS
SCALE
IN. 0 1 2 3 4 MI.
R.6E.
R.7E.
R.8E.
T.35N.
T.34N.
T.33N.
T.32N.
T.31N.
BUTTE CRK. RIM
HAT CRK. RIM
HARVEY MTN.
CONE MTN.
CAL MTN.
POISON L.
Non-Timber Area
BOGARD BUTTES
HAZARD UNITS
① COBLE MTN.
② HAT CRK. RIM
③ HALLS FLAT
④ BOGARD
PROPOSED SALE AREAS
Ⓐ BAINBRIDGE
Ⓑ LADDER BUTTE
Ⓒ CAL-CONE-HARVEY MTNS.
F.E.F. 3-6-53